

The NASA Flywheel Battery Project Summary

The NASA Flywheel Battery Project is a joint effort of the NASA Environmental Management Offices and HQ and GRC and the Aerospace Flywheel Technology Program funded by the Code R MSM (Energetics) Program. Our objectives are to demonstrate the viability of flywheel based un-interruptible power supplies (UPS) for NASA GRC applications. This demonstration includes the evaluation of advantages and disadvantages of flywheels and batteries as well as an on-site hardware system demonstration of a commercial flywheel UPS in the Flywheel Testbed in Building 333.

The rationale for this project is driven by the need for safer, environmentally friendly UPS systems for NASA missions. Significant potential advantages have been identified for flywheels as opposed to typical lead-acid batteries. These advantages include safety features such as no hydrogen gas or acid vapor release and easy shutdown and de-energization for maintenance. The advantages also include environmental features such as lower standby power losses and no lead disposal/recycling required. In addition, flywheel based UPS appear to have lower life cycle costs due to the advantages of significantly less maintenance and no periodic battery cell replacements.

The project was initiated in the fall of 2003. Call Henry, Inc. (CHI), the contractor at GRC that installs and maintains the bulk of our UPS systems, was tasked with procurement of the flywheel UPS system, installation in Building 333 and training of the flywheel testbed operations staff. The NASA GRC Environmental Management Office and the flywheel technology project provided requirements definition and UPS operations support. In addition, CHI and GRC staff provided support to conduct an evaluation of the critical comparison criteria between flywheels and chemical batteries. CHI awarded contracts to vendors Powerware (UPS) and Pentadyne (Flywheel unit) for the hardware. The hardware delivery, installation, checkout and training were completed by March, 2004 and the Flywheel UPS system was declared operational.

The Flywheel UPS system installed has the capacity to deliver 40KW to the facility 500V bus for approximately 40 seconds. The Flywheel UPS has been tied to a load bank in the COMET test facility in Building 333. Power loss and performance testing has been conducted to evaluate performance. The system has operated successfully for over 3800 hours and supported 12 power loss events. Flywheel UPS operation can be remotely monitored and tracked via internet hookup. The Unit is currently operational in the flywheel testbed and is being tied into the primary power bus that supports flywheel testbed critical operations. Evaluation of critical capabilities is being concluded and the flywheel/battery trade study will be included in the final report. Performance trending is being conducted and will be included in the final report. The current flywheel unit supplied from our vendor, Pentadyne, is a "Beta" development unit due to some early production issues that needed to be resolved at the vendors. Pentadyne will be supplying a production unit later this year to complete their contracted deliveries. The Final report will be completed by September 30, 2004.

